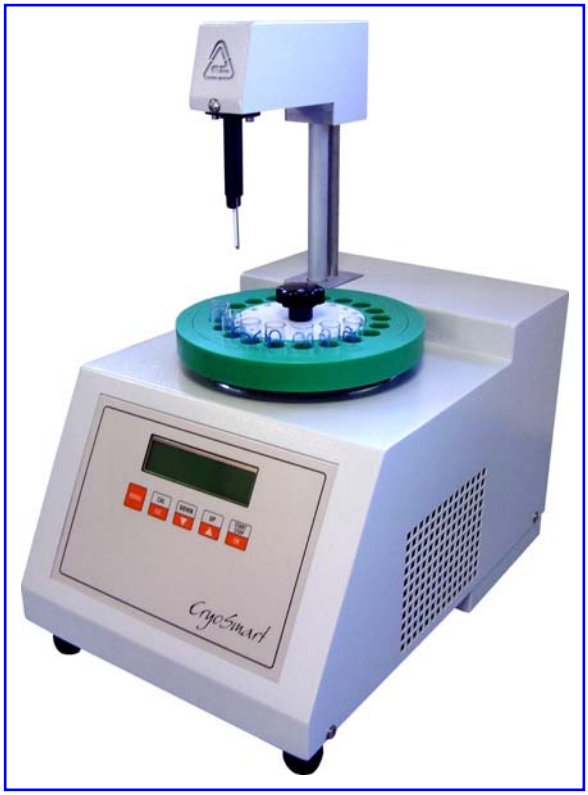
Troubleshooting

CryoSmart 1 - CryoSmart 20



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Troubleshooting

CryoSmart 1 - CryoSmart 20

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ASTORI SERVICE DEPARTMENT

In case of any trouble, please contact our SERVICE DEPARTMENT at the telephone number: **+39 030 2540240**, fax number **+39 030 2640812** or by e-mail at: **service@astorioscar.com**.

This manual was made to clarify the most frequent troubles and how to solve the problems occurring to our cryoscopes, when our technical assistance is not necessary.
In this manual you will find lots of possible causes describing problems, evaluated by the technical assistance.
Detailed descriptions are listed, problem by problem, along with clear explanations about how to solve them.
However, please do not hesitate to call us in case of any problem you might find; moreover, we would like to remind you that all our cryoscopes include a 12-month warranty period starting from the purchase date.

Kind regards.

Astori Tecnica s.n.c.

CHAPTER 1 - PROBLEMS AND SOLUTIONS

THE INSTRUMENT RETURNS “SAMPLE FAILED”

Problem:

The result of the analysis is “SAMPLE FAILED”.

Causes:

1. The “freezing stroke” is not strong enough for milk samples.
2. Thermistor failure (or not connected).

Solutions:

1. Adjust the “freezing stroke” (see “Freezing Stroke Adjustment”).
2. Check the connections of the thermistor.
3. Replace the thermistor.

-- If you press

the head goes down and immediately the instrument makes the “freezing stroke“: check the connections of the thermistor and/or replace it.

THE INSTRUMENT RETURNS “TIME OUT”

Problem:

The result of the analysis is ”TIME OUT”.

Causes:

1. The analyzed sample is too cold.
2. The milk is altered (high presence of salts, urea, etc.).
3. The temperature of the bath is too high or too low.
4. The agitation is too strong and air bubbles are created inside the sample; the sample is freezed before – 3°C.
5. The volume of the cooling liquid is not enough.
6. The carousel did not rotate (CryoSmart 20).
7. The magnet is disconnected (see “Head”).

Solutions:

1. Check the temperature of the milk sample.
Too cold samples freeze before the “freezing stroke”.
2. Verifiy, using other methods, if the milk sample has been altered.
3. Check the temperature of the bath: -7°C ± 0.5°C.
4. Adjust the agitation (see “Agitation adjustment”).
5. The sample tubes must be clean: please, check for it. The pump must replace the liquid at the end of every analysis, and the filter must be clean (see “Bath”, “Filter” and “Pump”)
6. Check the correct rotation of the carousel or the spring position (see “Spring”).
7. Check the magnet connections.

THE INSTRUMENT DOES NOT RUN THE ANALYSIS

Problem:

During an analysis, the temperature of the sample is the same one of the bath, but no error is displayed.

Causes:

1. The lower microswitch is not correctly pressed.

Solutions:

1. Check the lower microswitch inside the actuator.

BAD REPEATABILITY OF THE INSTRUMENT

Problem:

The instrument does not show a good repeatability.

Causes:

1. Altered samples.
2. Bad adjustment of the agitation .
3. Bad adjustment of the ”freezing stroke”.
4. Wrong temperature of the bath.
5. Wrong position of the thermistor.
6. Broken thermistor or bad connections.

Solutions:

1. Check the integrity of the samples.
2. Adjust the agitation (see “Agitation Adjustment”).
3. Adjust the “freezing stroke” (see “Freezing Stroke Adjustment”).
4. Check the entire fluidic system. Check the tubes (they must be clean); check the pumping system; check the liquid inside the tank (see “Rear Panel”), check the filter (replace it, if necessary).
5. Check the position of the thermistor (see “Thermistor Adjustment”).
6. Check the fixing of the thermistor.
7. Check the connections or replace the thermistor.

THE INSTRUMENT UNDERVALUES THE SAMPLES

Problem:

The result of the analysis is undervalued.

Causes:

1. The sample is too cold.
2. The “freezing stroke” is too weak.
3. The thermistor is broken.

Solutions:

1. Check the milk temperature.
2. Adjust the “freezing stroke” (see “Freezing stroke adjustment”).
3. Replace the thermistor.

THE INSTRUMENT OVERVALUES THE SAMPLES

Problem:

The result of the analysis is overvalued.

Causes:

1. The thermistor is broken.

Solutions:

1. Replace the thermistor.

THE FUSES BLOW

Problem:

When you switch the instrument on, the fuses blow.

Causes:

1. Diodes bridge failure.
2. Power supply failure.

Solutions:

1. Check the diodes bridges.
2. Check the power supply system.

INSUFFICIENT TEMPERATURE OF THE BATH (WAIT…)

Problem:

The instrument does not keep the working temperature.

Causes:

1. Cooling bath failure.
2. Cooling bath control system failure.

Solution:

1. Check the cooling bath (Peltier cell).
2. Check the T2 (IRF540) MOSFET transistor.

THE CAROUSEL DOES NOT ROTATE (CryoSmart 20)

Problem:

When you press

the carousel does not rotate.

Causes:

1. Rotation system failure.
2. The microswitch is not correctly pressed.

Solutions:

1. Check the correct functionality of the rotation system (mechanical and electrical).
2. Check the correct functionality of the microswitches inside the actuator.

WITH THE SAMPLING TUBE LOADED, THE HEAD DOES NOT GO DOWN

Problem:

The tube is inside the duct but the head does not come down.

Causes:

1. Wrong position of the photocell.
2. Photocell failure.

Solutions:

1. Check the position of the photocell (see “correct position of the photocell”).
2. Replace the photocell.

THE HEAD DOES NOT MOVE

Problem:

The head does not move but the photocell is in a correct position.

Causes:

1. Microswitches failure.
2. Actuator failure.

Solutions:

1. Check the microswitches.
2. Check the actuator.

THE STIRRER DOES NOT WORK

Problem:

The stirrer does not work.

Causes:

1. Magnet failure.

Solutions:

1. Check the magnet connections.

THE STIRRER BREAKS THE SAMPLING TUBES

Problem:

The stirrer breaks the sampling tubes.

Causes:

1. The “freezing stroke” is too strong.

Solutions:

1. Adjust the “freezing stroke” (see “freezing stroke adjustment”)

THE INSTRUMENT DOES NOT PRINT ANY DATA

Problem:

The instrument does not print the results of the analyses or the parameters.

Causes:

1. Communication failure.

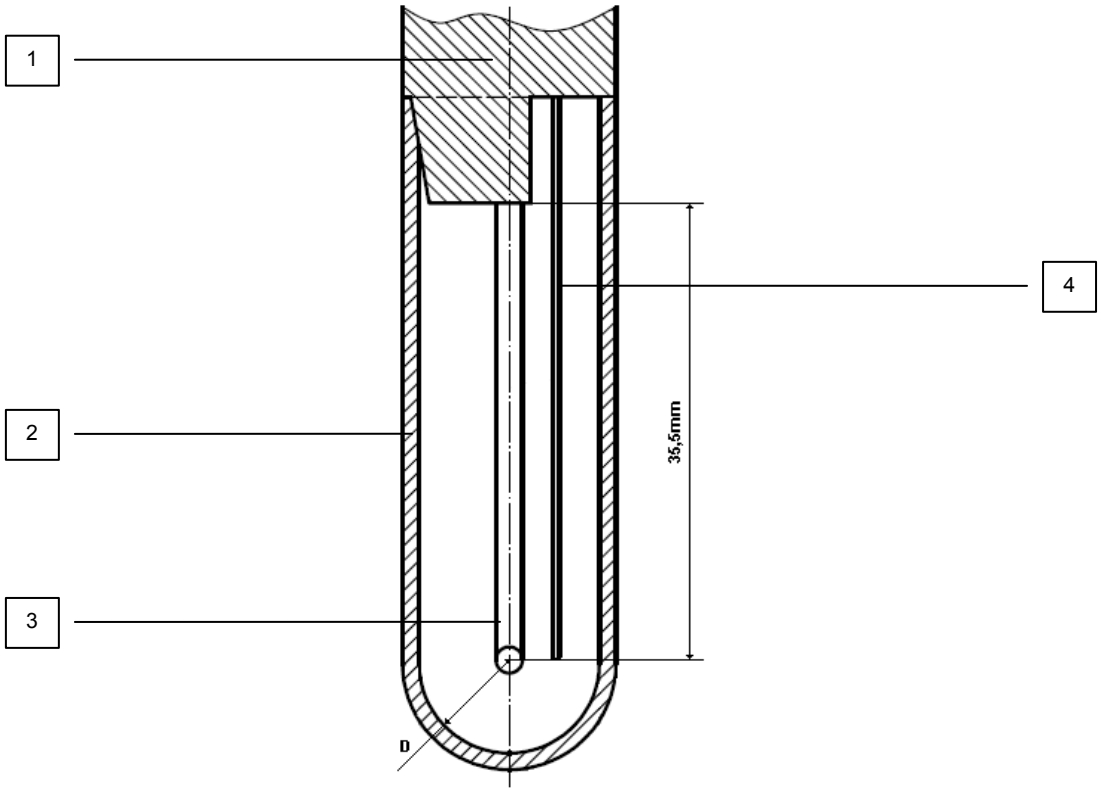
Solutions:

1. Check the connections of the printer (see “Printer communication”).

CHAPTER 2 - ADJUSTMENTS

THERMISTOR ADJUSTMENT

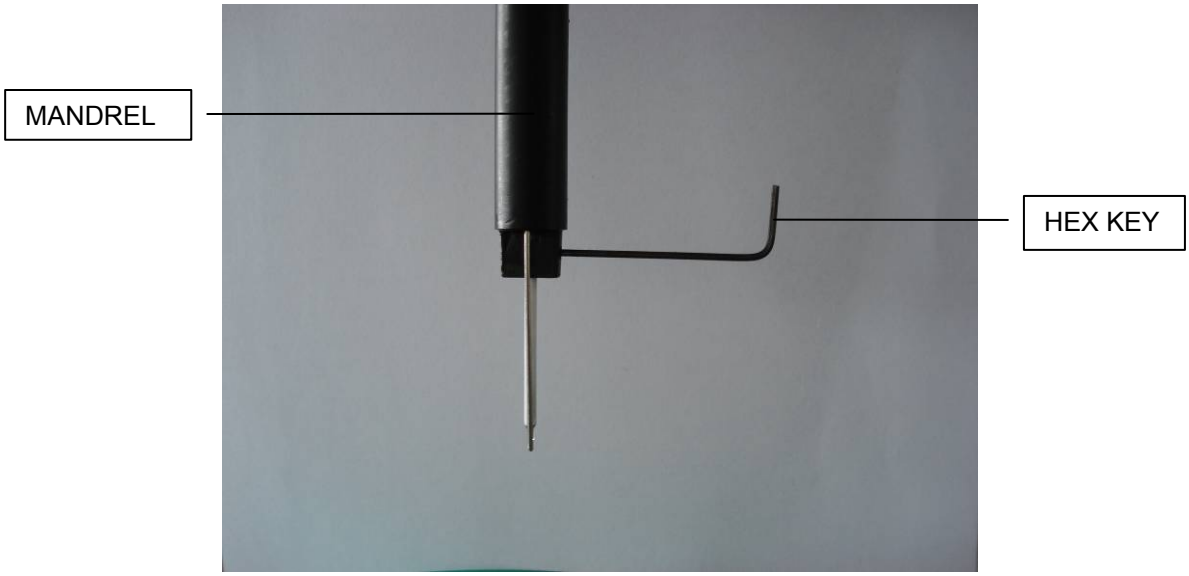
The correct position of the thermistor is showed here below. The glass ball of the thermistor must be at the center of the semisphere and at 35,5 mm from the mandrel.



1. Mandrel
2. Tube
3. Thermistor
4. Stirrer

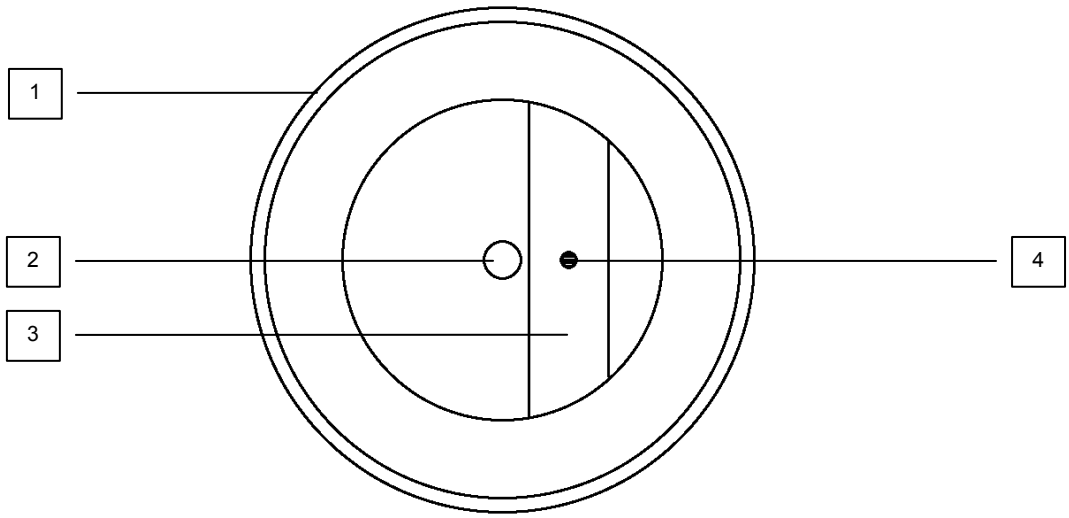
If the position is not correct, please follow this procedure:

1. Unscrew the screw with the hexagonal socket in its head that fixes the thermistor at the mandrel.
2. Place the thermistor in the correct position.
3. Fix the thermistor at the mandrel.
4. Check the clamping of the thermistor.



STIRRER ADJUSTMENT

The stirrer and the thermistor have to be at the same level (see “Thermistor adjustment”).
The stirrer must be centered like shown in the picture here below, and it must vibrate symmetrically and freely inside the slot (see “mandrel” and see “head”).



1. Mandrel
2. Thermistor
3. Slot
4. Stirrer

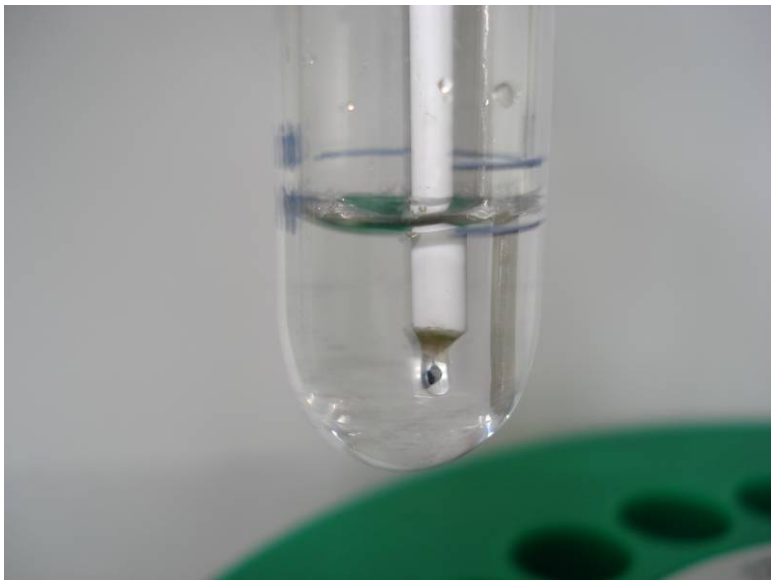
AGITATION ADJUSTMENT

The agitation must avoid the production of air bubbles inside the tube. This adjustment procedure can be made by using a calibration standard.
In perfect working conditions, the maximum stirrer amplitude is 2-3 mm when the stirrer itself is properly placed inside the calibration standard.
To check the agitation strength, please follow this procedure:

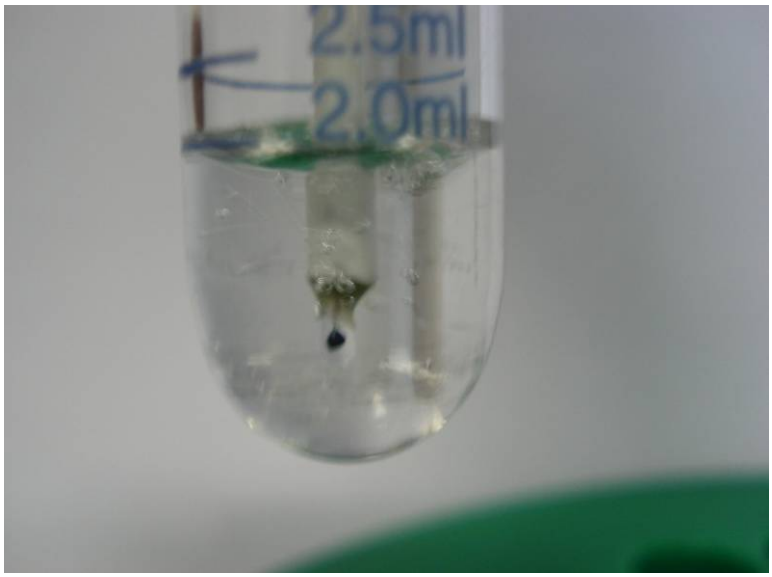
1. Enter the main menu by pressing MENU.
2. Search for **Agitation Test**.
3. Press START STOP OK.
4. Fill a tube with a calibration standard up to the level (volume) normally used with a sample during a common analysis.
5. Place the tube under the mandrel (as a normal analysis should be performed).
6. Press START STOP OK to start the test, press CAL ESC to finish the test.

-- If the agitation looks too strong or too weak, follow these steps:

1. Enter the main menu by pressing MENU.
2. Search for **Agitation Amplitude**.
3. Increase or decrease the value by pressing UP DOWN.



CORRECT



WRONG

FREEZING STROKE ADJUSTMENT

The correct “freezing stroke” must: hit the walls of the tube, stir all the liquid, avoid the breakage of the tubes.
To adjust the freezing stroke, please follow this procedure:

1. Enter the main menu by pressing MENU
2. Search for **Stirrer Test**.
3. Press START STOP OK.
4. Fill a tube with a calibration standard up to the level (volume) normally used with a sample during a common analysis.
5. Place the tube under the mandrel (as a normal analysis should be performed).
6. Press START STOP OK to start the test, press CAL ESC to finish the test.
7. Run a lot of tests to check if the undesired possibility to break a tube exists.

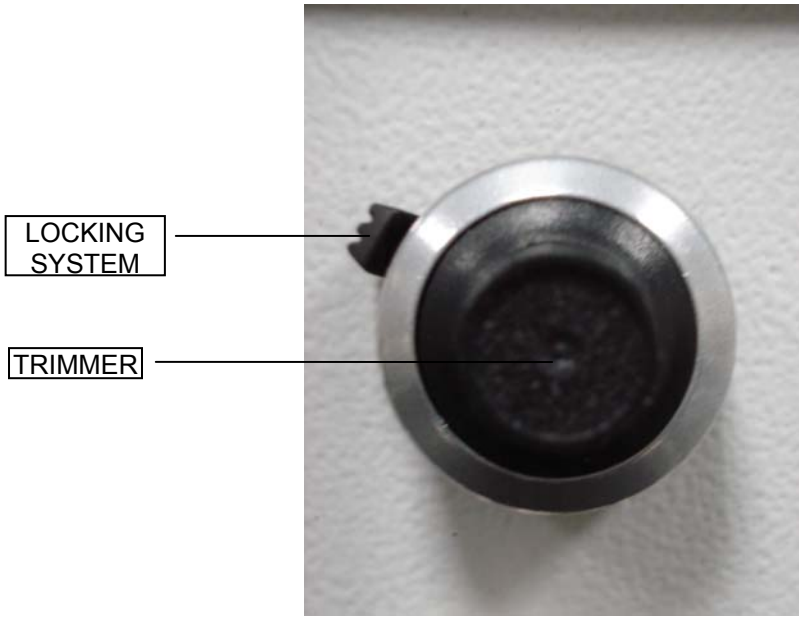
-- If during a test the stirrer breaks a tube, proceed like described here below:

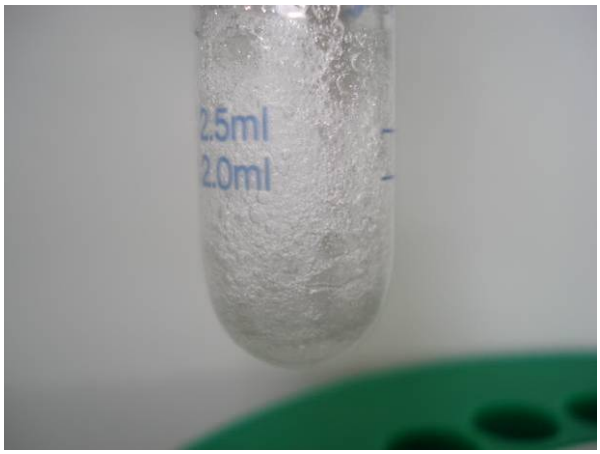
1. Enter the main menu by pressing MENU.
2. Search for **Stirrer Test**.
3. Press START STOP OK.
4. Press START STOP OK to start the test.
5. Unlock the adjustment trimmer (see “Rear panel”).
6. Decrease the value by turning it anticlockwise.
7. Lock the trimmer again.

8. Press CAL / ESC.
9. Run some new tests to check for the undesired possibility to break a tube.

-- If the freezing stroke is too weak, follow the steps here below:

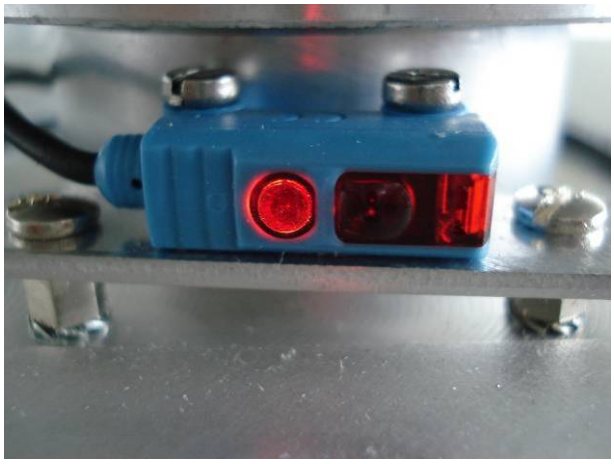
1. Enter the main menu by pressing MENU.
2. Search for **Stirrer Test**.
3. Press START / STOP / OK.
4. Press START / STOP / OK to start the test.
5. Unlock the adjustment trimmer (see “Rear panel”).
6. Increase the value by turning it clockwise.
7. Lock the trimmer again.
8. Press CAL / ESC.
9. Run some new tests to check for the undesired possibility to break a tube.

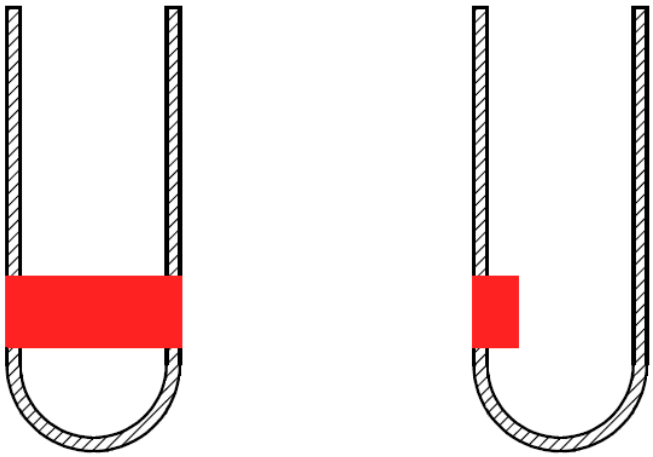




CORRECT POSITION OF THE PHOTOCELL (CryoSmart 20)

The correct position of the photocell is described in the next pictures.
The photocell must point over the semisphere.





THERMISTOR REPLACEMENT

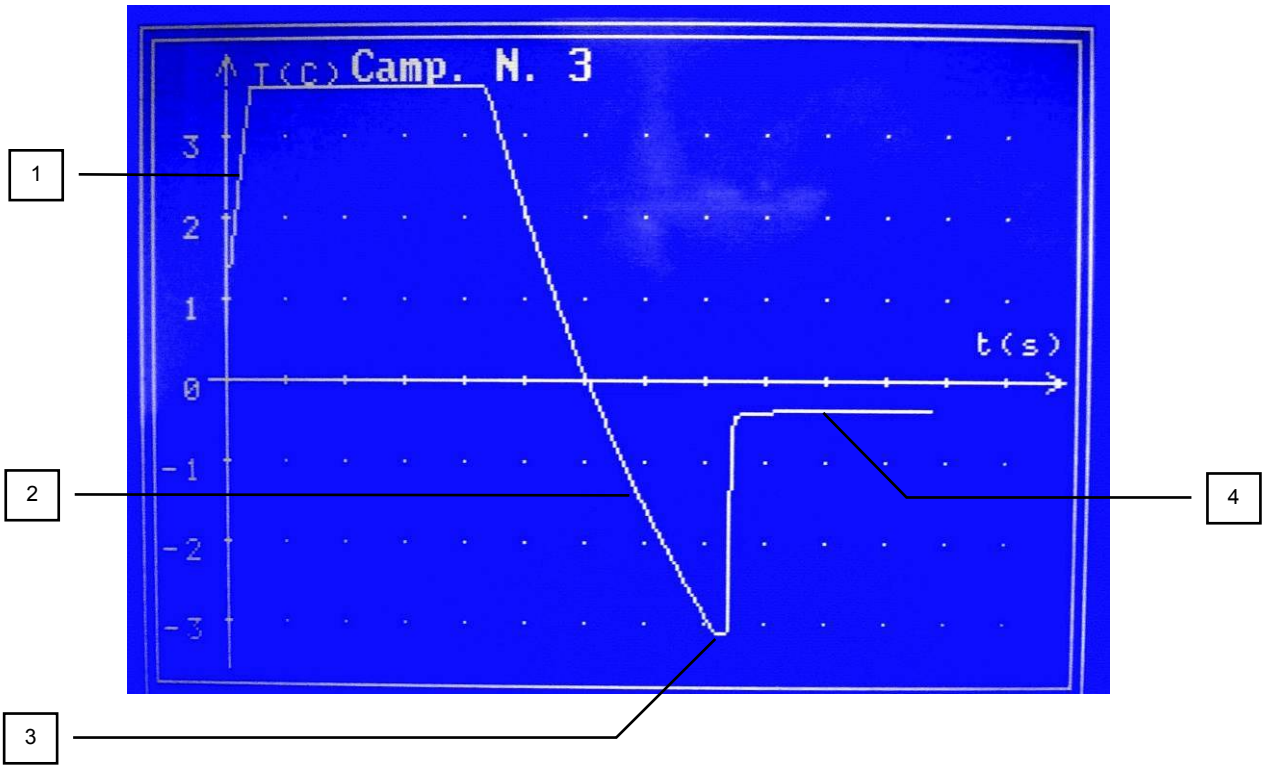
To replace a thermistor, please follow the procedure as described here below:

1. Disconnect the instrument from the main supply.
2. Open the head.
3. Unscrew the screw (the one with the hexagonal socket in its head) that fixes the thermistor at the mandrel (see “Thermistor Adjustment“)
4. Get the soldered cables free from their insulation coats (see “Head“).
5. Unsolder the thermistor cables.
6. Extract the thermistor from the mandrel by pulling it down.
7. Insert the new thermistor from the bottom of the mandrel. Please, pay attention! Do not hit the thermistor glass ball.
8. Solder the cables of the new thermistor. Check that the new solders are done correctly.
9. Insulate the solders.
10. Check the thermistor position (see “Thermistor Adjustment”).
11. Fix the thermistor.
12. Fix the cables of the thermistor; be careful not to tend them and not to place them too close to the stirrer and/or the magnet. (see “Head”)
13. Close the head.
14. Proceed with a new calibration procedure (see “Calibration”).

CHAPTER 3 - ANALYSIS AND CALIBRATION

ANALYSIS

The correct analysis of the cryoscopic point should respect the following curve:



1. Start analysis
2. Agitation
3. Freezing stroke
4. Plateau

CALIBRATION

Before running each calibration procedure, check the condition of the calibration standards.
Gently turn the bottle upside down and rotate it several times to mix its content thoroughly. The standard solutions should not be used if the bottle is filled for less than one quarter in comparison to its total capacity.
The shelf life of the standards covers 12 months from the date of production.

To perform a correct calibration procedure, please follow the instructions here below:

1. Enter the main menu by pressing the

button.
2. Search for **Calibration Reset**.
3. Press the

button.
4. Press

again to confirm.
5. Clean the mandrel, the thermistor and stirrer with a piece of soft paper.
6. Prepare **1** sample of the **- 0.408°C** calibration standard.
7. Start the analysis by pressing

.
8. Wait until the end of the analysis and press the

button.
9. Press

.
10. Press

to confirm the calibration.
11. Clean the mandrel, the thermistor and the stirrer with a piece of soft paper.
12. Prepare **1** sample of the **- 0.600°C** calibration standard.
13. Start a new analysis by pressing

.
14. Wait until the end of the analysis, then press the

button.
15. Press

.
16. Press

.
17. Press

again to confirm.

Now, a new calibration procedure is necessary.
Repeat the operations from step 5 to 17 using **3** replicates for each calibration standard.
Check the repeatability of the values: if the repeatability is bad, check the thermistor for any breakage; maybe, it requires a replacement.

After finishing the calibration procedure, run a new analysis with **5** replicates of the **- 0.512°C** calibration standard.

-- If the repeatability of the 5 replicates looks good but the value is different from **- 0.512°C,** follow this procedure:

1. Enter the main menu by pressing

.
2. Select **To Linearize**.
3. Increase or decrease the value if the results are overvalued or undervalued using the

buttons. Any variation of ± 5 on “Linear” means ± 0.001°C.

Example:

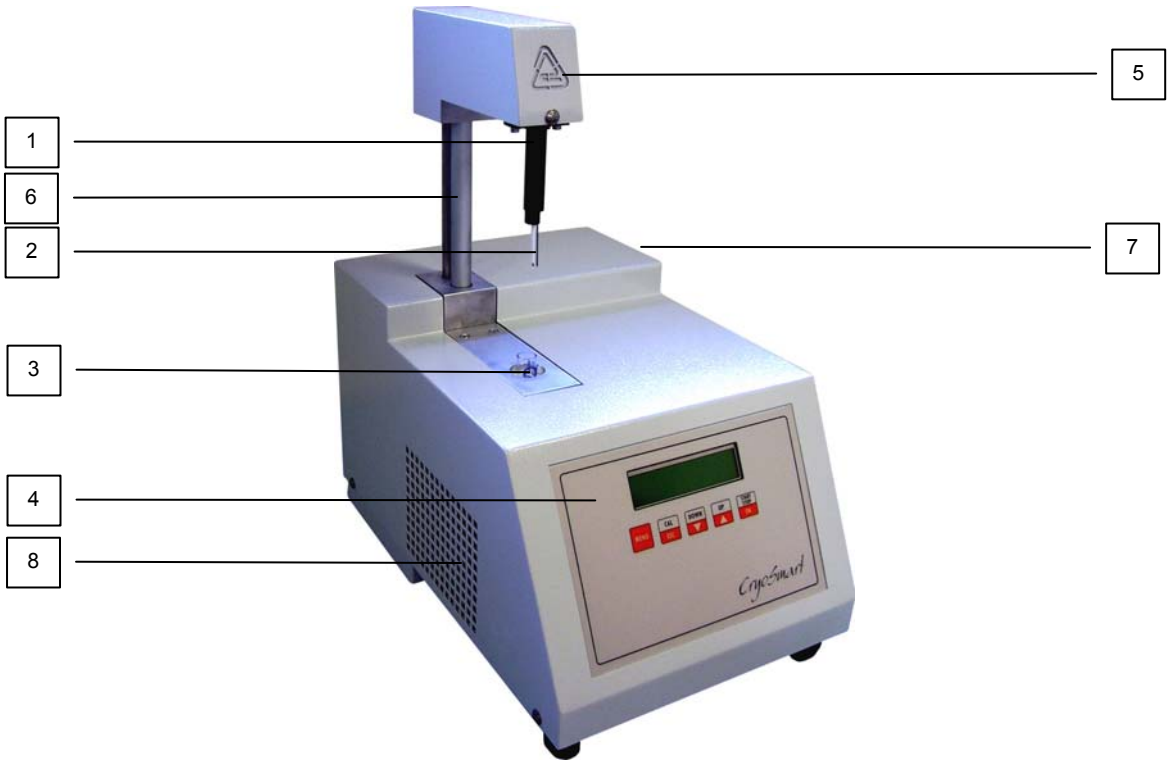
VALUE READED	LINEARITY	MODIFY	NEW VALUE
-0.513°C	-15	+5	-10
-0.510°C	+10	-10	0

4. Switch the instrument off and on if you change the linearity value.

CHAPTER 4 - INSTRUMENT

PARTS

-- CryoSmart 1

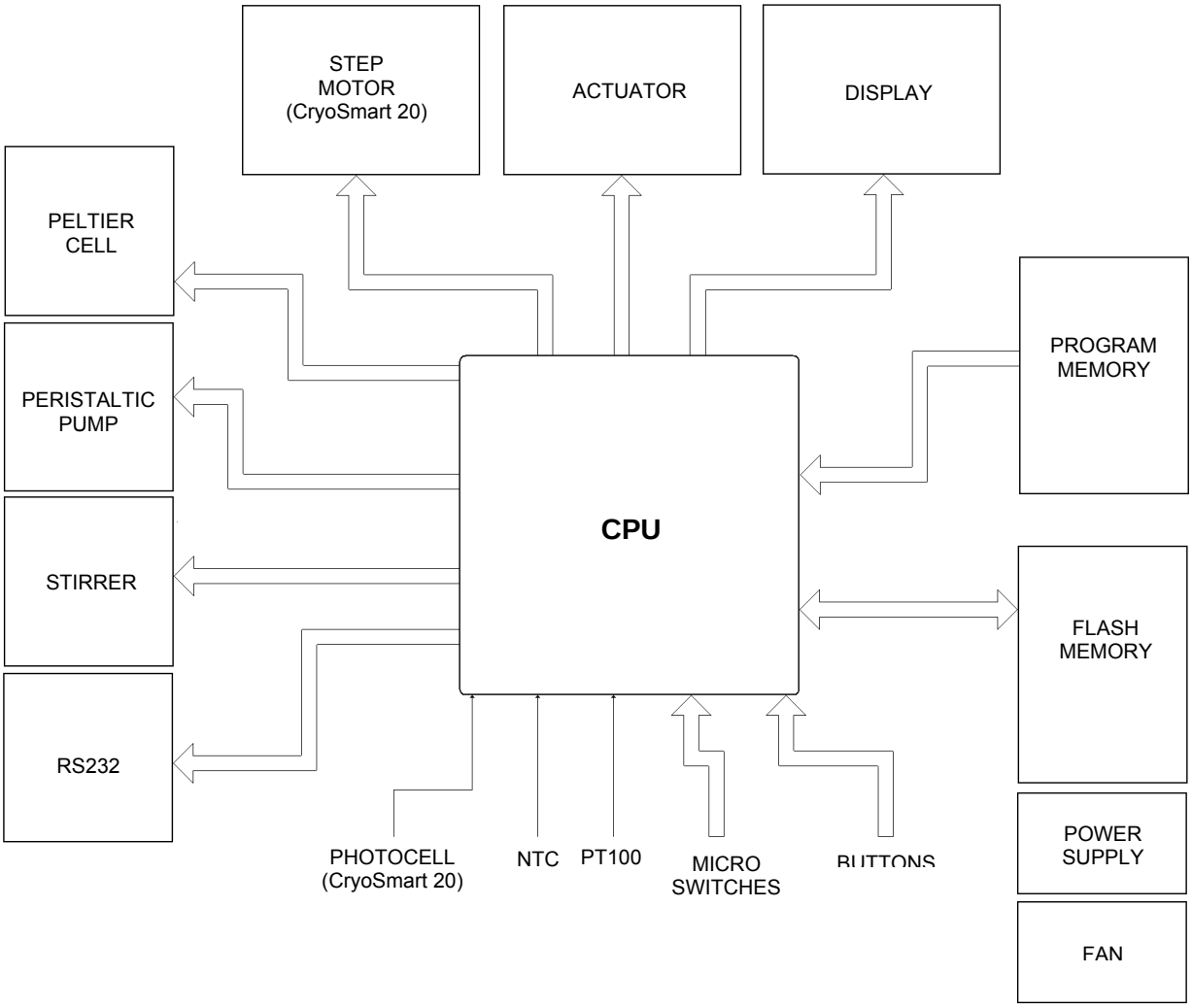


1. Mandrel
2. Thermistor and Stirrer
3. Duct
4. Front panel
5. Head
6. Actuator
7. Rear Panel
8. Grate

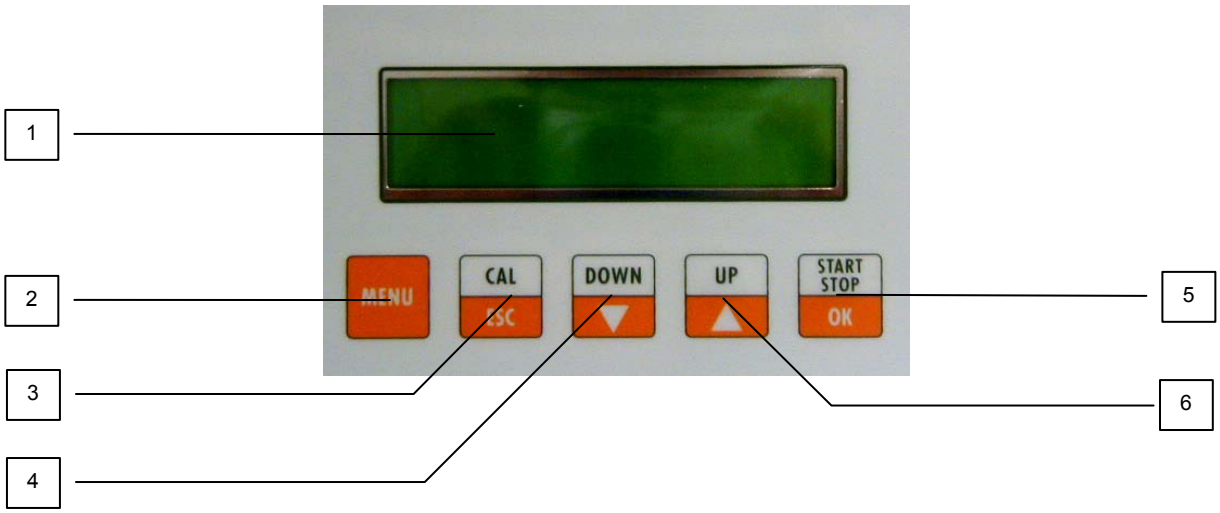
-- CryoSmart 20

1. Head
2. Mandrel
3. Actuator
4. Carousel
5. Rear Panel
6. Grate
7. Thermistor and Stirrer
8. Front Panel

BLOCK DIAGRAM



FRONT PANEL



1. Display
2. MENU
3. CAL / ESC
4. DOWN / ▼
5. START-STOP / OK
6. UP / ▲

The keys have two different colours: the white side runs the operational functions of the instrument; the orange side allows the visualization and modification of the functions after entering the “MENU”.

The

button allows to enter and to scroll through the functions. It allows to scroll through the calibration menu.

The START-STOP / OK key

is used to start or stop the analysis. Pay attention: put the sample first and then press START.
When the START key is pressed and the analysis has started, the display shows the sample temperature, the reference value to calculate the added water percentage and, after the freezing stroke has done, the added water percentage of the sample.
The START-STOP key is also used to give confirmations (OK) and it allows to enter and confirm the functions of the menu.

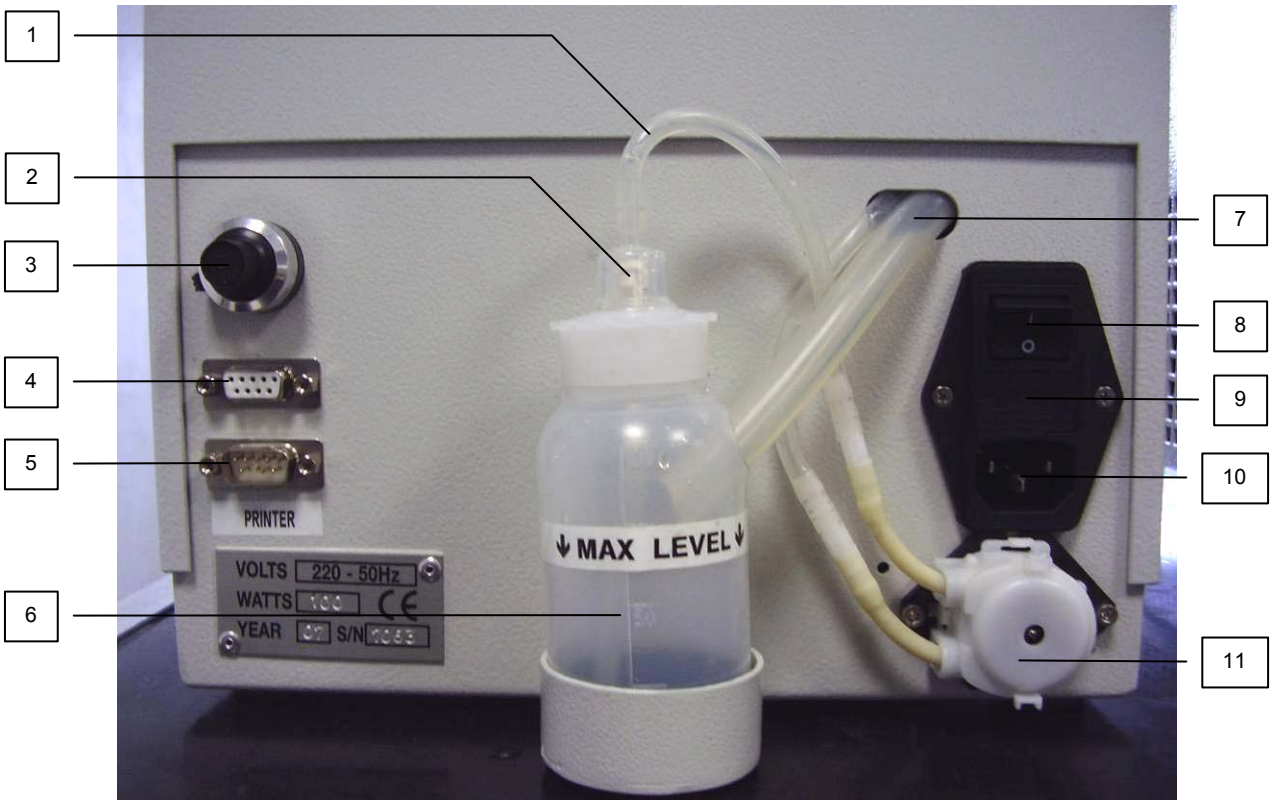
The CAL/ESC key

(when used as ESC) allows to exit the functions of the menu. When used as CAL, it allows the calibration of the instrument.

The keys

are used to manually lower and raise the head, by pressing and releasing the proper key.

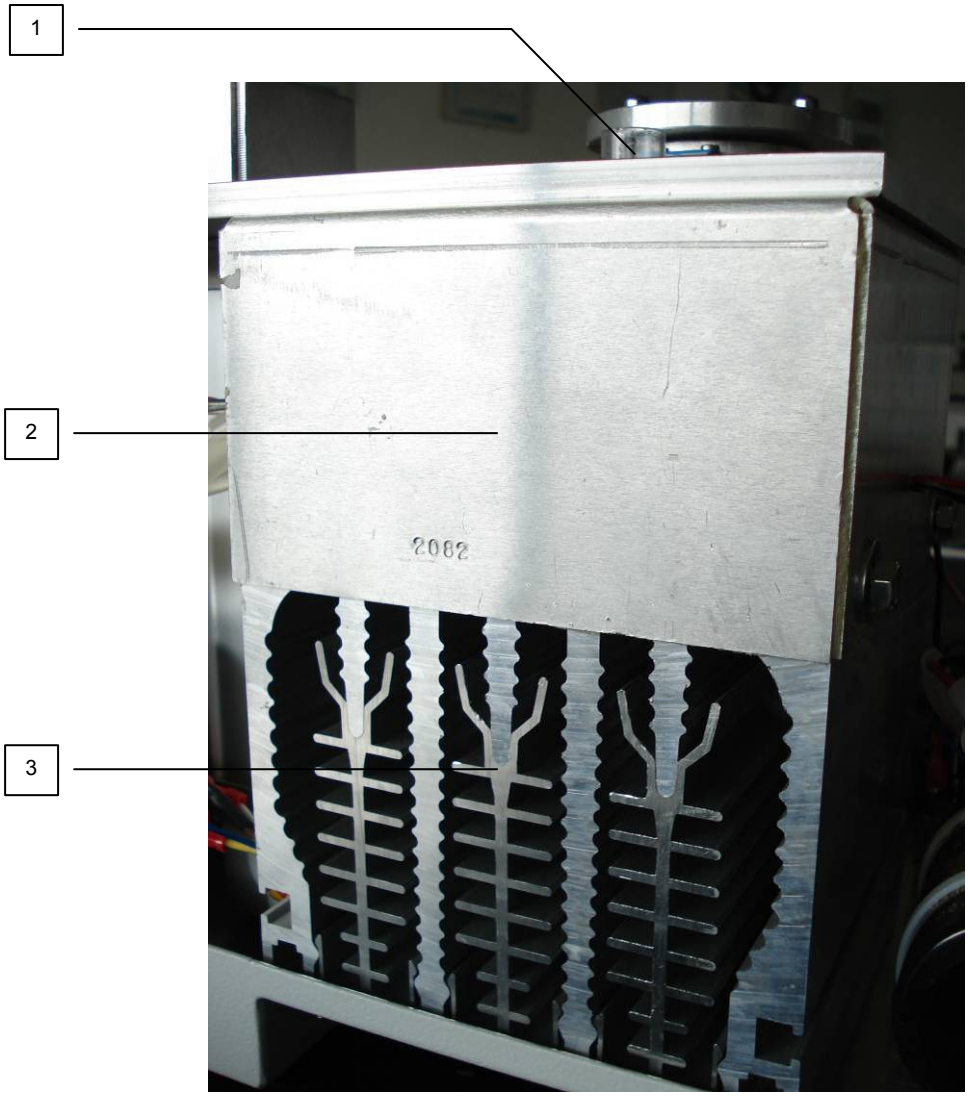
REAR PANEL



1. Automatic refilling tube
2. Filter
3. Trimmer
4. Data input (Program)
5. Printer
6. Cooling liquid tank
7. Waste
8. Main switch
9. Fuses compartment
10. Supply connector
11. Peristaltic pump

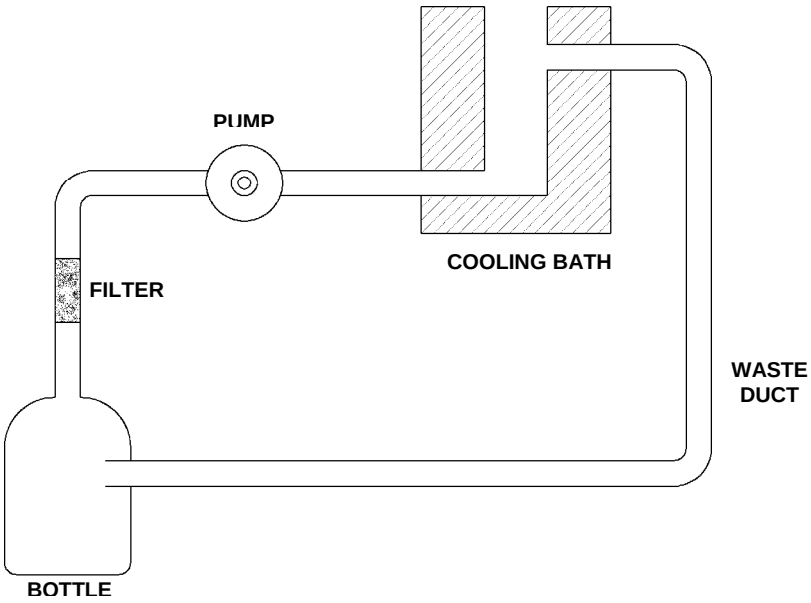
BATH

The bath is cooled by means of a Peltier cell (+15 V AC) at –7°C ± 0.5°C .

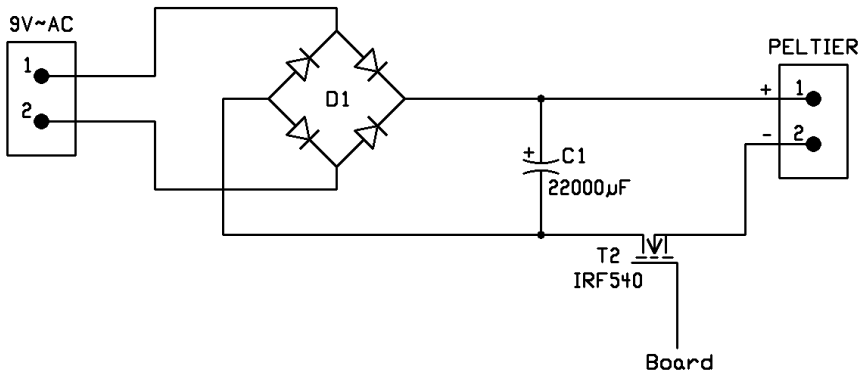


1. Duct
2. Cooling bath body
3. Cooling system

The replacement of the liquid inside the bath is possible by: the external bottle, the peristaltic pump and the waste tube.
When the instrument is turned on, the refilling of the bath is performed automatically.
At the end of every analysis, the cooling liquid is completely replaced thanks to the circuit, just described.



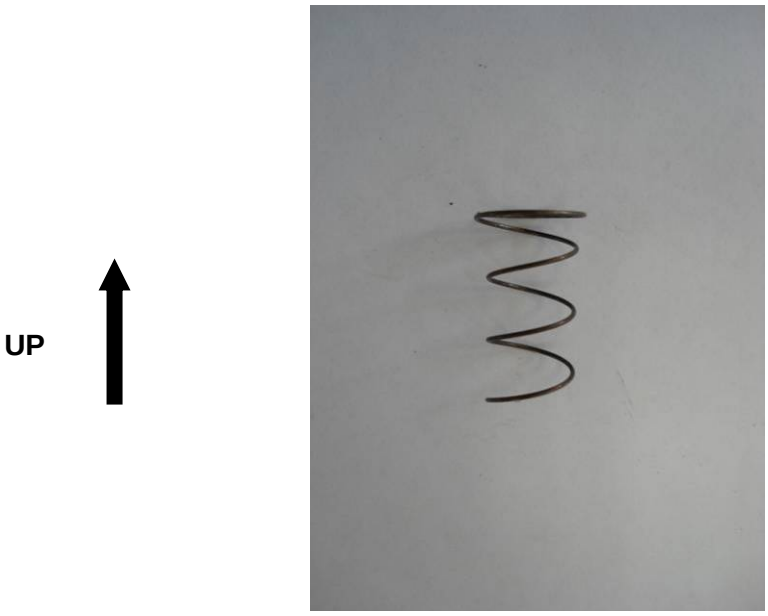
The temperature control in the bath is realized like in the figure below.
The PT100 probe sends data to the electronic control board, directly. A PID controller pilots the MOSFET transistor IRF540.
The fan system gets the heat (produced by the Peltier cell) out of the equipment. (see “Fan”).



SPRING

Inside the cooling bath there is a spring for the sample tube.
Pay attention! The spring must be positioned in the duct exactly as described in the picture below.

-- CryoSmart 1:

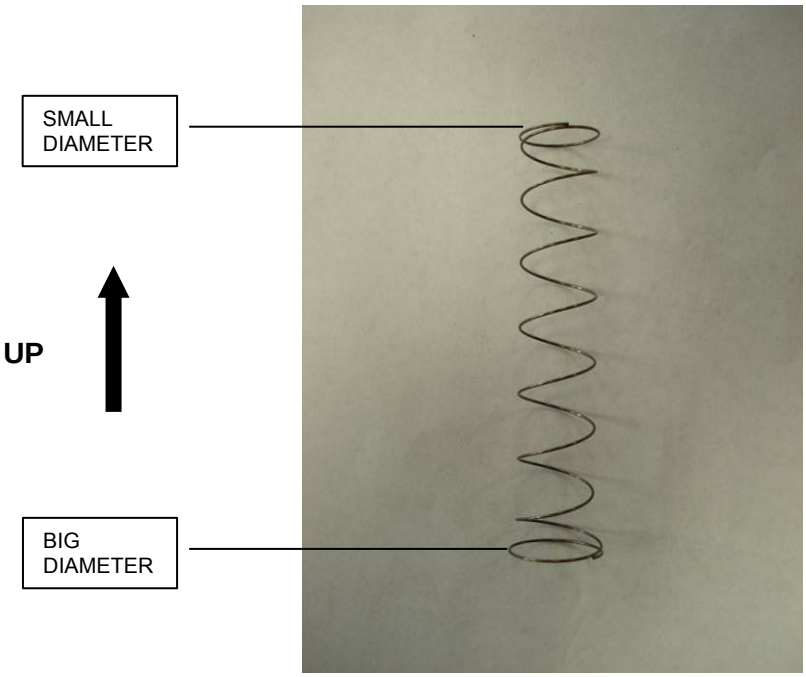


-- CryoSmart 20:

The spring must be at the same level of the bath's duct.

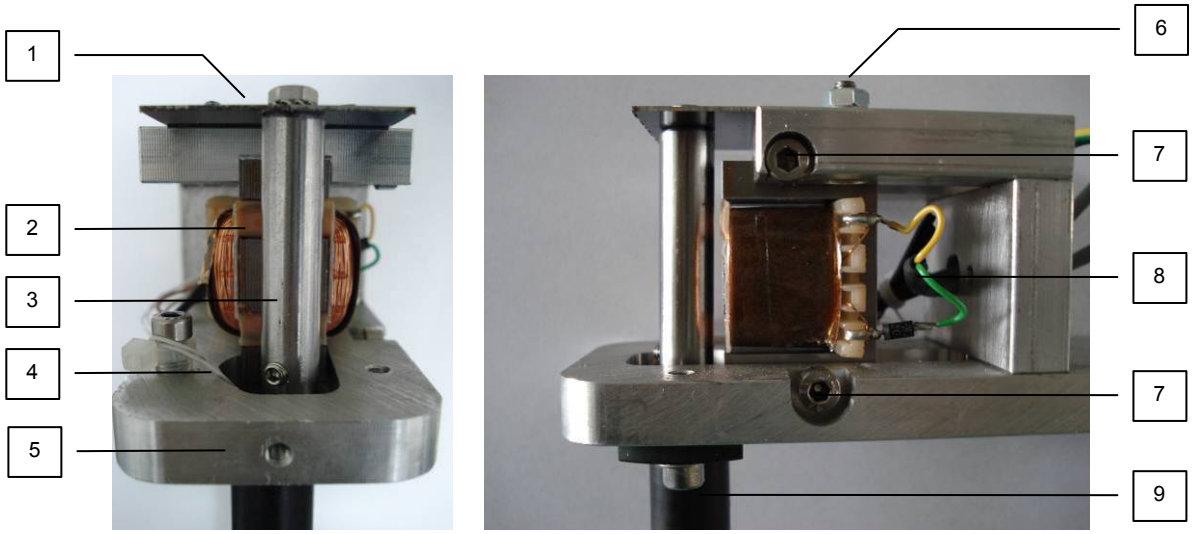
-- If the spring is positioned higher than the duct, probably will be dragged by the tubes.

-- If the spring is too low, probably will prevent the carousel rotation.



HEAD

Inside the head there are the following components: the magnet, the lamina who allows the stirrer swing, and the connections of the thermistor.



1. Lamina
2. Magnet
3. Stirrer support
4. Thermistor cables
5. Head
6. Centering nut
7. Magnet clamper
8. Stirrer cables
9. Mandrel

To center the stirrer, please follow this procedure:
1. Unscrew the nuts and move the lamina until the stirrer is in the correct position. (see “Stirrer Adjustment”).
2. Screw the nuts again.

One method to adjust the “Freezing Stroke” and the agitation is by moving the magnet:
Unscrew the screw (the one with the hexagonal socket in its head) that clamps the magnet, in order to approach and move away the magnet from the stirrer support.

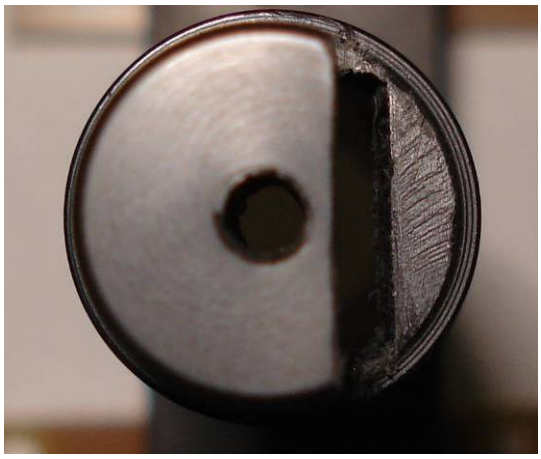
1. By moving the magnet closer, the “freezing stoke” becomes gentler and its working quality improves, but the agitation becomes too strong.

2. By moving the magnet away, the agitation works better, but the “freezing stroke” increases its power and a breakage of the sample tubes becomes possible.

Find the better position where both agitation and “freezing stroke” work correctly.
Then clamp the magnet again.
After finishing these operations, adjust the agitation and the freezing stroke.
(see “Agitation Adjustment” and “Freezing Stroke Adjustment”).

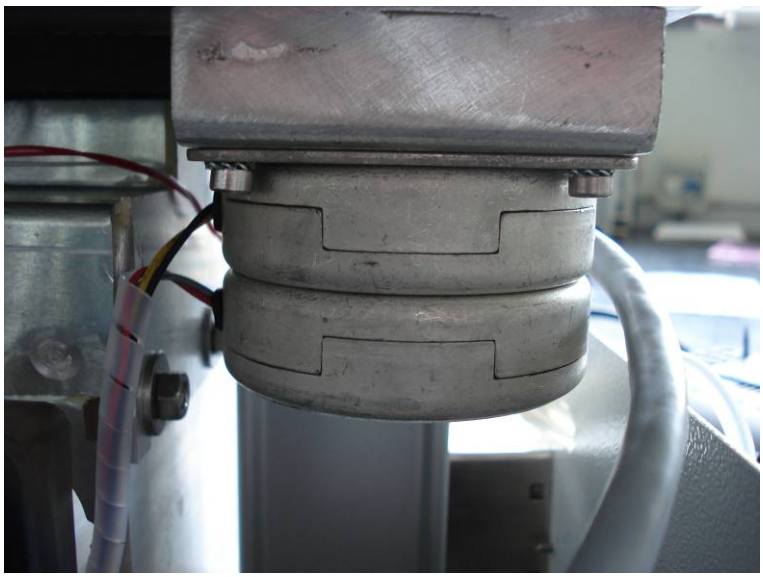
MANDREL

The thermistor and the stirrer are located inside the mandrel.



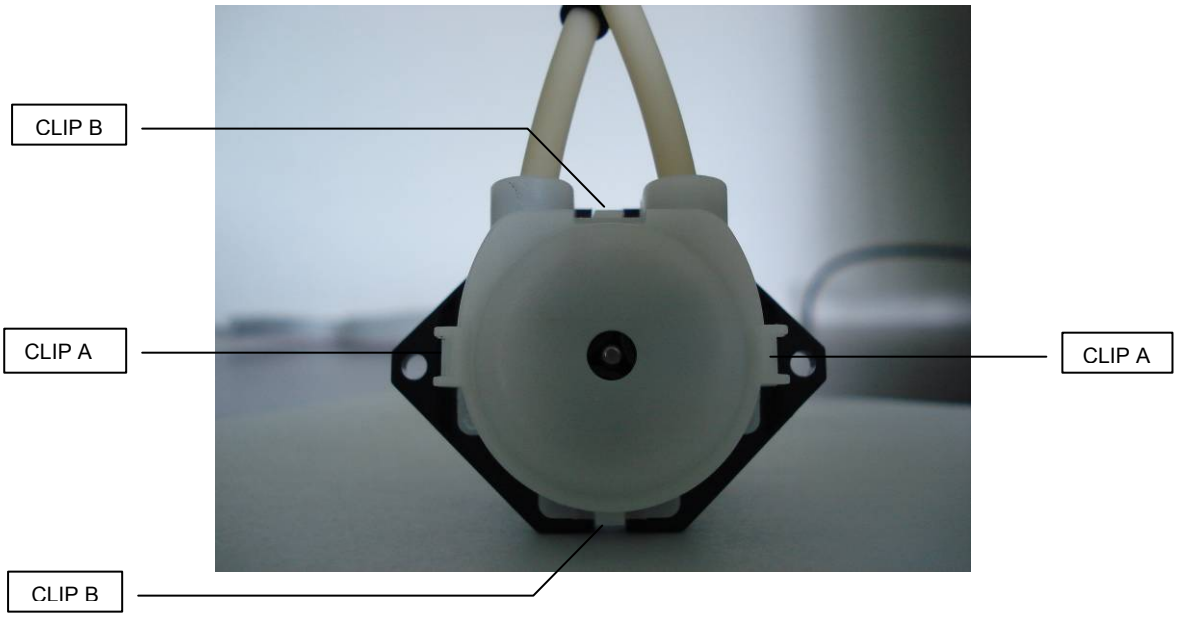
MOTOR (CryoSmart 20)

The step motor moves the carousel.



PUMP

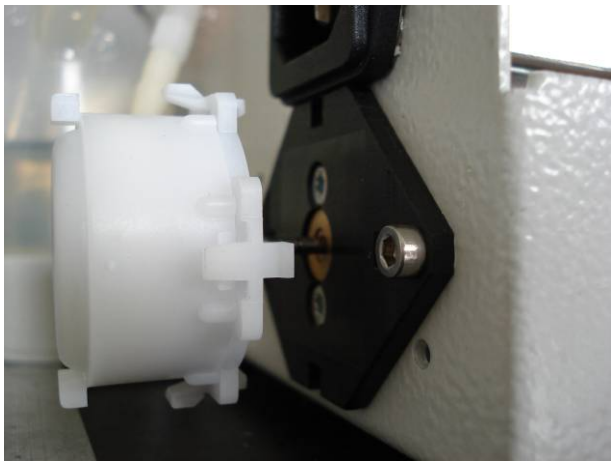
The pump is the element that allows the refilling of the liquid inside the cooling bath.



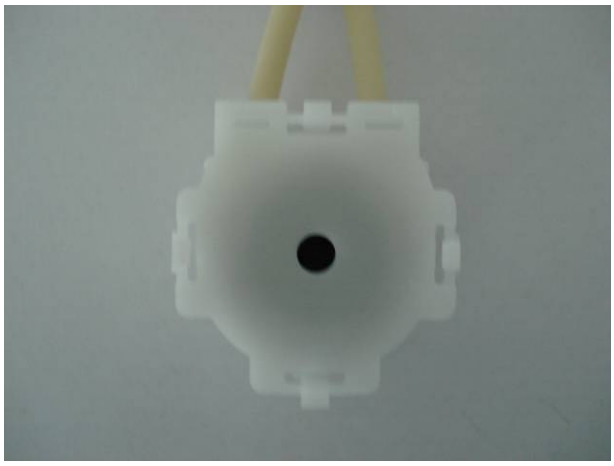
If the pump is dirty, an insufficient volume of liquid may be replaced inside the bath.

To clean and replace the tube, please follow this procedure:

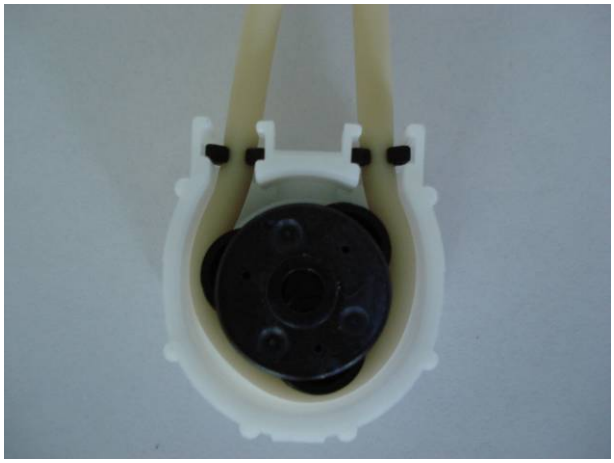
1. Release the pump by pressing the A clips.



2. Open the pump by pressing the B clips.



3. Replace the tube.



FILTER

If the filter is dirty, the cooling liquid cannot fill the cooling bath properly, so that the results may be inaccurate.
Replace the filter when decribed.
Pay attention! Place the filter in the right position. The arrow (on the filter body) must be addressed upfront.

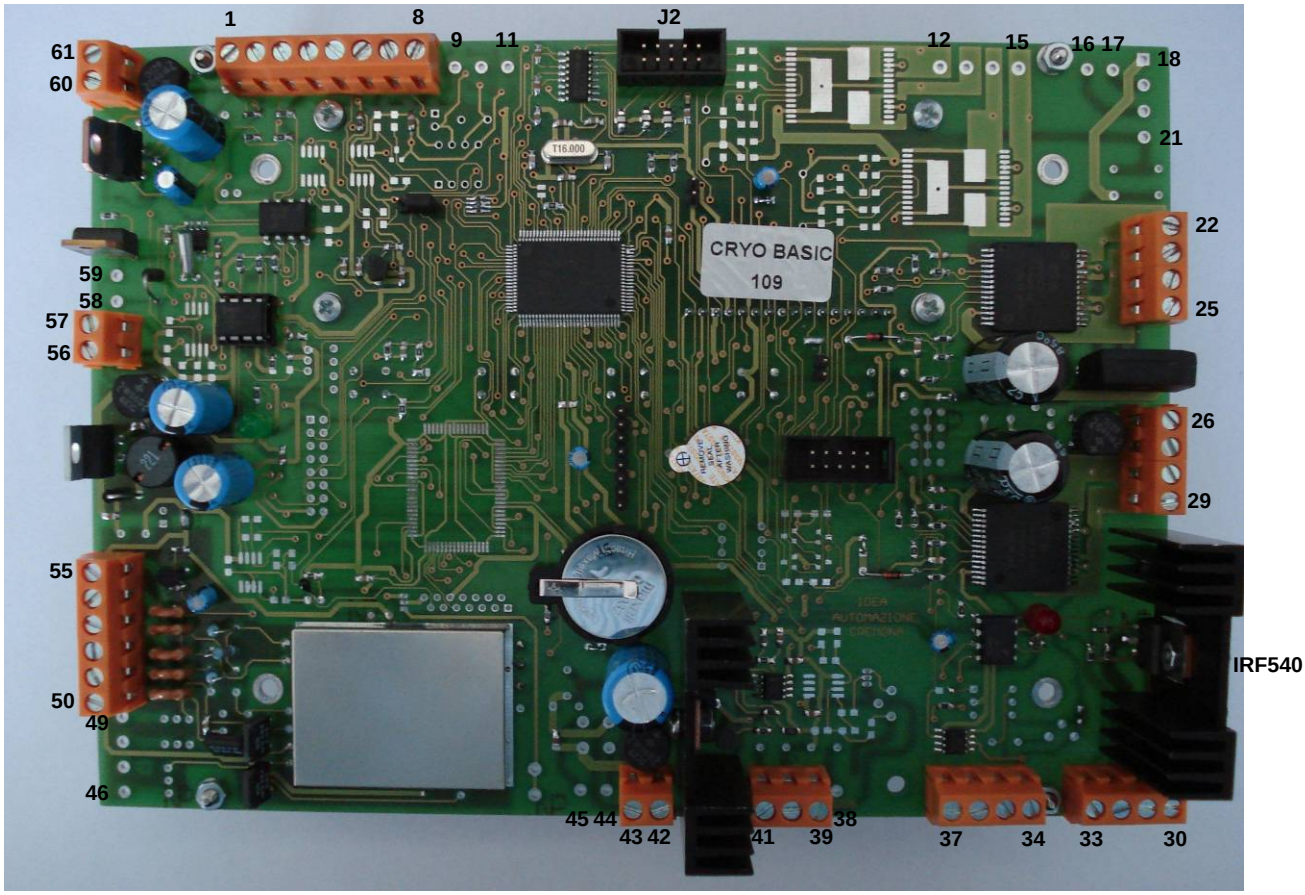
ACTUATOR

The actuator is the component that moves the head up and down.
The microswitches are located inside the actuator.

BOARD

The board allows all the following operations:

1. Move the head.
2. Rotate the carousel.
3. Read data from the photocell.
4. Control the cooling bath.
5. Pilot the stirrer.
6. Read data from the thermistor.
7. Communicate with the printer .
8. HMI (Human Machine Interface).

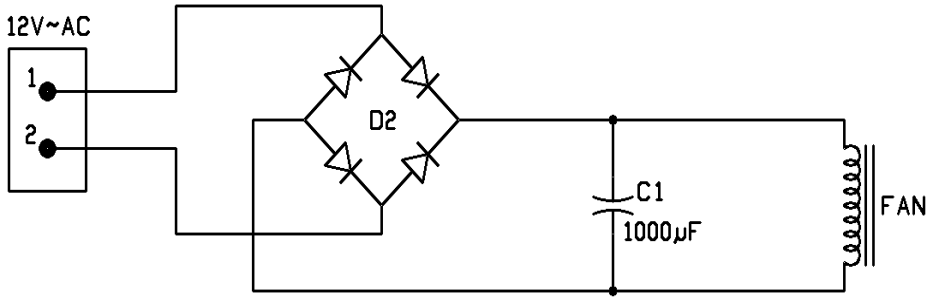


# PIN	PIN Name	Type	# Connection
1	Photocell A	IN	3
2	Photocell B	IN	4
3	Photocell +12 V	OUT	5
4	Photocell GND	OUT	6
5	NC	-	-
6	Microswitch Common	IN	7
7	Microswitch Up	IN	8
8	Microswitch Down	IN	9
9	NC	-	-
10	NC	-	-
11	NC	-	-

12	Step Motor	IN	10
13	Step Motor	IN	11
14	Step Motor	IN	12
15	Step Motor	IN	13
16	9 V ~ AC (step motor)	IN	14
17	9 V ~ AC (step motor)	IN	15
18	NC	-	-
19	NC	-	-
20	NC	-	-
21	NC	-	-
22	+ Actuator	OUT	16
23	- Actuator	OUT	17
24	12 V ~ AC (actuator)	IN	18
25	12 V ~ AC (actuator)	IN	19
26	9 V ~ AC (pump)	IN	14
27	9 V ~ AC (pump)	IN	15
28	+ Pump	OUT	20
29	- Pump	OUT	21
30	GND	IN	22
31	Peltier Control	OUT	23
32	NC	-	-
33	+12 V Peltier	IN	24
34	Relè Stirrer	OUT	25
35	Relè Stirrer	OUT	26
36	NC	-	-
37	NC	-	-
38	NC	-	-
39	0 V transformer (stirrer)	IN	27
40	GND stirrer	IN	28
41	Relè Stirrer	IN	29
42	15V ~ AC (agitation)	IN	30
43	15V ~ AC (agitation)	IN	31
44	NC	-	-
45	NC	-	-
46	NC	-	-
47	NC	-	-
48	NC	-	-
49	NC	-	-
50	Thermistor	IN	32
51	Thermistor	IN	33
52	Thermistor Shield	OUT	34
53	Pt100	IN	35
54	Pt100	IN	35
55	Pt100	IN	36
56	8 V ~ AC (CPU)	IN	37
57	8 V ~ AC (CPU)	IN	38
58	NC	-	-
59	NC	-	-
60	12 V ~ AC (sensors)	IN	18
61	12 V ~ AC (sensors)	IN	19

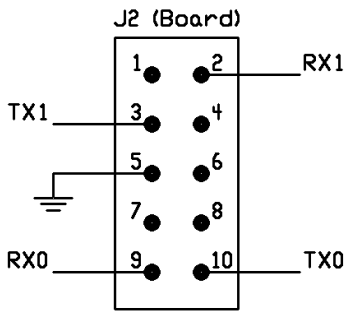
FAN

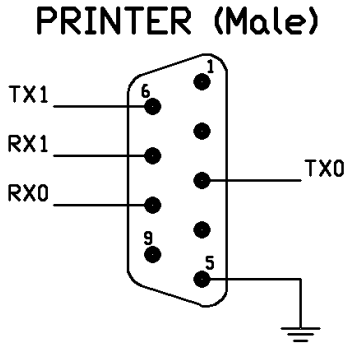
The fan system takes the heat produced by the peltier cell out of the unit.



PRINTER COMMUNICATION

The communication from the board up to the printer is realized with a RS232 communication interface.

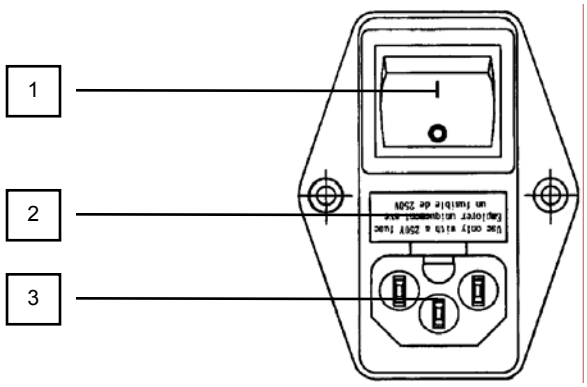




FUSES

The instrument has 2 fuses of 6,3 A each.
To replace the fuses, please follow this procedure:

1. Disconnect the cryoscope from the main supply.
2. Open the fuse compartment.
3. Replace the fuses.



1. Main switch
2. Fuse compartment.
3. Supply connector.

FEATURES

-- Mechanical features:

Dimensions: 255 x 360 x 370 mm
Weight: 18,5 Kg

-- Electrical features:

Power supply: 230 V – 50 Hz
Electrical consumption: 150 W
Overload fuses: 2 x 6,3 A
Main supply voltage maximum fluctuations: ± 10% of the nominal voltage
Transient overvoltages: II
Board: CryoSmart2
Software: 1.5

-- Operating features:

Maximum altitude: 2000 m
Maximum relative humidity: 80% for temperatures up to 31°C decreasing linearly to 50% relative humidity at 40°C.
Operating temperature: from +5°C to +40°C.
Storage temperature: from –10°C to +50°C.